Induction of pluripotency in human umbilical cord mesenchymal stem cells in feeder layer-free condition

ABSTRACT

Induced Pluripotent Stem Cells (iPSCs) has been produced by the reprogramming of several types of somatic cells through the expression of different sets of transcription factors. This study consists of a technique to obtain iPSCs from human umbilical cord mesenchymal stem cells (UC-MSCs) in a feeder layer-free process using a mini-circle vector containing defined reprogramming genes, Lin28, Nanog, Oct4 and Sox2. The human MSCs transfected with the minicircle vector were cultured in iPSCs medium. Human embryonic stem cell (ESC)-like colonies with tightly packed domelike structures appeared 7ï 10 days after the second transfection. In the earliest stages, the colonies were green fluorescence protein (GFP)-positive, while upon continuous culture and passage, genuine hiPSC clones expressing GFP were observed. The induced cells, based on the ectopic expression of the pluripotent markers, exhibited characteristics similar to the embryonic stem cells. These iPSCs demonstrated in vitro capabilities for differentiation into the three main embryonic germ layers by embryoid bodies formation. There was no evidence of transgenes integration into the genome of the iPSCs in this study. In conclusion, this method offers a means of producing iPSCs without viral delivery that could possibly overcome ethical concerns and immune rejection in the use of stem cells in medical applications.

Keyword: Induced Pluripotent Stem Cells (iPSCs); Umbilical cord mesenchymal stem cells; Embryoid bodies